

REMARKS

Claims 4-12 were pending, all of which stand rejected. Claims 4 and 8 have been amended. New Claims 13-30 have been added.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Title

As requested, the title has been amended to be more descriptive of the claimed invention.

Drawings

The drawings were objected to under 37 CFR 1.83(a) for failing to show every feature of the claims. In particular, the Examiner stated "the plurality of holes that are in a second portion of the first surface of said heat sink that is adjacent to said die, in claim 10 must be shown or the feature(s) canceled from the claims(s)." The Examiner is respectfully referred to Figs. 10J and 10K, which show a plurality of holes 168 that are in a portion of heat sink 144A that is adjacent to die 142A. See page 17, lines 1-7, of the specification.

Specification

The Examiner objected to the specification on the basis that the cross-reference to related applications needed to be updated. This has been done. Reconsideration and withdrawal of the objection is requested.

Claim Rejections – Double Patenting

Claims 4-12 were rejected under the judicially created doctrine of double patenting over U.S. Patent No. 6,256,200 and provisionally rejected over Claims 1-3 of Application No. 09/898,212 (now U.S. Patent No. 6,452,802). Enclosed with this Amendment are terminal disclaimers with overcome this ground of rejection.

Claim Rejections – 35 U.S.C. §112

Claims 10-12 were rejected under 35 U.S.C. §112, second paragraph, because, according to the Examiner, "In claim 10, it is unclear and confusing to what shows 'the plurality of holes that are in a second portion of the first surface of said heat sink that is

adjacent to said die.’ The first portion of the heat sink appears to have grooves or notches formed within the heat sink.”

As explained above, Figs. 10J and 10K and the specification at page 17, lines 1-7, show and describe “holes 166” and “holes 168” which provide full support for the limitations of Claim 10. The rejection of Claims 11 and 12 was based entirely on their dependency on Claim 10.

Claim Rejections – 35 U.S.C. §102

Claims 4, 6, 8 and 9 were rejected under 35 U.S.C. §102(b) as being anticipated by Wakefield.

With regard to Claim 4, the Examiner referred specifically to Fig. 7 of Wakefield, which he said shows a “heat sink 110”. The Applicants respectfully disagree. The member labeled “110” in Fig. 7 is described as a “suitably transparent body 110”, which may be made of “glass or a suitably transparent plastic” (col. 7, lines 65-66). Wakefield states that plastic “is not a particularly effective heat transfer medium” (col. Lines 65-66). Thus body 110 is not a “heat sink”.

Claim 6 depends from Claim 4 and is allowable for at least the same reason.

With regard to Claim 8, the Examiner referred specifically to Fig. 6 of Wakefield and stated that Wakefield teaches a “lead 20 attached to a second surface of the die (**attached by 23**)”. The member labeled “23” in Wakefield is a wire (see col. 6, line 52). Claim 8 has been amended to recite, among other things, “a sheet metal lead spanning the second principal surface of the die, said sheet metal lead being bonded to the second principal surface of the die through a . . . layer of an electrically conductive adhesive”. The reference to a “sheet metal lead” is supported at least at page 8, line 14, and at page 13, lines 3-5. Claim 8, as amended, clearly distinguishes over Fig. 6 of Wakefield for at least this reason.

Claim 9 depends from Claim 8 and is allowable for at least the same reason.

Claims 4, 5 and 7 were rejected under 35 U.S.C. §102(b) as being anticipated by Kato et al., with particular reference to Fig. 8 of Kato et al. The Examiner stated that Kato et al. show “a lead 2 attached to a second surface of the die (**attached by 6 and 3a**).” Claim 4 has been amended to recite “a sheet metal lead spanning the second principal surface of the die”, “said sheet metal lead being bonded to the second principal surface of the die through a second layer of an electrically conductive adhesive”, and “opposite ends of the lead

protruding from opposite sides of the capsule”. In Kato et al., the numeral “6” identifies a bonding wire (col. 5, line 54) and the numeral “3a” identifies an epoxy molded layer containing crystalline silica (col. 5, lines 62-64). Epoxy molded layer 3a is apparently not “electrically conductive”; otherwise, bonding wires 6 would be shorted together and lead 2 would be shorted to bed part 21. Moreover, lead 2 of Kato et al. does not “span” a surface of die 4, and opposite ends of lead 2 do not “protrude from opposite sides of the capsule” (see Fig. 10; col. 6, lines 34-35). Claim 4, as amended, clearly distinguishes over Fig. 8 of Kato et al. for at least this reason.

Claims 5 and 7 depend from Claim 4 and are allowable for at least the same reason.

Claims 4, 6, 8 and 9 were rejected under 35 U.S.C. §102(b) as being anticipated by Suzuya et al., with particular reference to Fig. 3 of Suzuya et al. The Examiner stated that Suzuya et al. show “a lead 3,6,7 attached to a second surface of the die (**attached by 11,81,83,8,82,2**)” and “opposite ends of the lead protruding from the capsule”. Claims 4 and 8 have been amended to recite “a sheet metal lead spanning the second principal surface of the die, said sheet metal lead being bonded to the second principal surface of the die through a second layer of an electrically conductive adhesive” and “opposite ends of the lead protruding from opposite sides of the capsule”. Fig. 3 of Suzuya et al. is a cross-sectional view taken at line F3—F3 of Fig. 4 (col. 5, lines 45-46). It is apparent from both of these drawings that Suzuya et al. does not teach or suggest a “sheet metal lead” that “spans” the die 1. Moreover, there is no lead that has opposite ends “protruding” from opposite ends of the capsule. Further, there is no sheet metal lead that is “bonded to the second principal surface of the die through a . . . layer of an electrically conductive adhesive (see col. 8, lines 41-44). Claims 4 and 8, as amended, clearly distinguish over Fig. 3 of Suzuya et al. for at least these reasons.

Claim 6 depends from Claim 4 and Claim 9 depends from Claim 8. Claims 6 and 9 are therefore allowable for at least the reasons stated above.

Thus, Applicants respectfully submit that Claims 4-9 are patentable over Wakefield, Sato et al., or Suzuya et al. Reconsideration and withdrawal of this rejection is respectfully requested.

Claim Rejections – 35 U.S.C. §103

Claims 10-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Suzuya et al. in view of Kato et al. The Examiner cited Suzuya et al. as showing “the features

of the claimed invention as detailed above". Kato et al., with particular reference to Fig. 8, was cited as showing "the heat sink 1,2 having the plurality of holes 7 having a second portion of the first surface of said heat sink that is adjacent to said die 4".

Each of Claims 10-12 depends from Claim 8. For the reasons described above, Claim 8 is patentable over Suzuya et al. Kato et al., applied for the reason stated by the Examiner, adds nothing to Suzuya et al. as regards the patentability of Claim 8. Therefore, for at least this reason, Claims 10-12 are allowable over the combination of Suzuya et al. and Kato et al. Reconsideration and withdrawal of this rejection is respectfully requested.

New Claims 13-30 have been added. Support for each of the new claims is found at least at the following locations in the application:

Claim 13	Fig. 10A; col. 9, lines 56-57
Claim 14	Fig. 10C; col. 9, lines 62-63
Claim 15	Figs. 9A-9D; col. 9, lines 42-45
Claim 16	Col. 5, lines 46-47
Claim 17	Col. 5, lines 46-47
Claim 18	Fig. 6E; col. 8, lines 36-38
Claim 19	Fig. 6A; col. 7, lines 50-52
Claim 20	Fig. 6D; col. 7, lines 48-49; col. 8, lines 24-29
Claim 21	Fig. 8F
Claim 22	Fig. 6E
Claim 23	Fig. 6E; col. 8, lines 36-38
Claim 24	Fig. 6E; col. 5, lines 36-47; col. 8, lines 31-36
Claim 25	Fig. 6E; col. 8, lines 36-38
Claim 26	Fig. 7C; col. 9, lines 2-7
Claim 27	Fig. 7C; col. 9, lines 2-7
Claim 28	Fig. 7C; col. 9, lines 2-7
Claim 29	Fig. 7D; col. 9, lines 7-9

Claim 30 Fig. 7H; col. 9, lines 18-24

New Claims 13-20 depend from Claim 4 and are allowable for the reasons stated above. It is respectfully submitted that each of new Claims 21-30 clearly distinguishes of the prior art cited in this case.

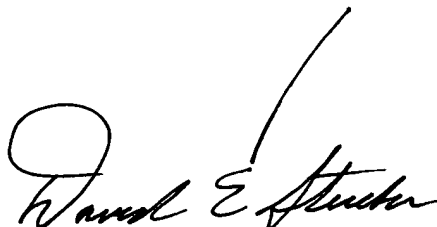
For the above reasons, Applicants respectfully request allowance of Claims 4-30. Should the Examiner have any questions concerning this response, the Examiner is invited to call the undersigned at (408) 982-8200, ext. 1.

Please note that a new docket number has been assigned to this application.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on December 19, 2002

 12/19/02
Attorney for Applicant(s) Date of Signature

Respectfully submitted,


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Version with markings to show changes made

In the Claims

Claims 4 and 8 are amended as follows.

4. (Amended) A semiconductor package comprising:
a semiconductor die having first and second principal surfaces;
a heat sink bonded [lead attached] to the first principal surface of the die
through a first layer of a conductive adhesive;
a sheet metal lead spanning the second principal surface of the die, said sheet metal lead being bonded [heat sink attached] to the second principal surface of the die
through a second layer of an electrically conductive adhesive; and
a [conductive] capsule encasing the die and at least a portion of the lead and the heat sink, opposite ends of the lead protruding from opposite sides of the capsule, wherein said heat sink includes a rim enclosed by said capsule.
8. (Amended) A semiconductor package comprising:
a semiconductor die having first and second principal surfaces;
a heat sink, at least a portion of a first surface of the heat sink being bonded [lead attached] to the first principal surface of the die through a first layer of a conductive adhesive;
a sheet metal lead spanning the second principal surface of the die, said sheet metal lead being bonded [heat sink, at least a portion of a first surface of the heat sink being attached] to the second principal surface of the die through a second layer of an electrically conductive adhesive; and
a nonconductive capsule encasing the die and at least a portion of the lead and the heat sink, opposite ends of the lead protruding from opposite sides of the capsule, wherein a plurality of holes are formed at the first surface of said heat sink.

In the Specification

The paragraph beginning at page 1, line 6, as amended as follows:

This application is a divisional of Application No. 09/898,212, filed July 2, 2001, now U.S. Patent No. 6,452,802, issued September 17, 2002, which is a continuation of Application No. 09/322,124, filed May 27, 1999, now U.S. Patent No. 6,256,200, issued July 3, 2001, and is related to Application No. 09/322,127, now U.S. Patent No. 6,307,755, issued October 23, 2001, each of which is incorporated herein by reference in its entirety.

The paragraph beginning at page 14, line 5, as amended as follows:

The structure is then encased in a capsule of injection-molded plastic (not shown) and, as shown in Fig. 6E, tie bars 107 and 109 are trimmed, yielding six leads 130A-130F connected to the source terminal of die 110 and two leads 132A and 132B connected to the gate terminal of die 110. As is evident, leads 130A-130F and 132A and 132B form structures that are symmetrical about an axis 131 of die 110. Furthermore, until the leads are trimmed from the leadframe, the leads are held stable by only the outer tie bars 107 and 109 and did not require any central tie bars which produce the torque and twisting common to the asymmetrical designs described in the above-referenced U.S. Patent No. 6,307,755 [Application No. [Attorney Docket No. M-7546 US]].